REMARKS

Reconsideration is respectfully solicited.

The present claims include the recitations relating to the following items:

a) the compound specifically described on page 23 of the specification is used to form a coating composition in liquid state having a viscosity of 500 - 10,-000 cps at room temperature;

b) the coating composition is spin coated onto a substrate; and

c) as-coated film on the substrate which is still in liquid state is irradiated with UV light for photosetting, thereby giving a cured film exhibiting a scattering loss of 0.1 dB / cm or less for a light having a wavelength of 0.85μm, even though the cured film has a thickness of several ten microns.

The low scattering loss is a result of use of such compounds in the coating composition and to irradiating the coated film remaining in liquid state for photosetting. Therefore, the coating composition recited in the present claims is highly effective in making optical waveguides.

Applicants submit that the following factors should be considered: The components in a coating composition of D2, EHPE-3150, has a softening point of 85± 10° C and is solid at room temperature. In order to spin-coat it to form a cured film, it is dissolved in an organic solvent(s) with a photoinitializer for photosetting, to coat the solution on a substrate and to irradiate the as-coated film with a light (e.g. UV light).For example, when THF (tetrahydrofuran) is used as an organic solvent, the as-coated film (by spin-coating) is already in solid state at room temperature before irradiation with UV light to cure it. The as-coated film exhibits high scattering loss in visible region when the film has a thickness of several ten microns or more. Further, after curing by UV irradiation, the cured film also exhibits high scattering loss, that is, the loss of more than

1 dB / cm is observed for a light having a wavelength of 0.85 μm. For the purpose of decreasing the scattering loss, various composition including a wide variety of other ingredients were extensively examined. However, no composition achieving a scattering loss of 0.2 dB / cm or less is obtained. For making a spin-coated film of solid materials, selection of the solvent is also important factor, so that various solvents are examined. The applicant found that diglyme (i.e. diethylene glycol dimethyl ether) affords a film exhibiting a scattering loss of 0.2 dB / cm.

Applicants respectfully traverse the rejection of claims under 35 U.S.C. § 103(a) as being obvious over Fan et al. (EP 0446672) in view of Tsukamoto et al. (U.S. Patent 5,902,715), Ueno (JP 09243869), Watanabe et al. (U.S. Patent 6,218,281), and the Elliott excerpt.

The Patent Office agreed with Applicants' arguments that the combined disclosures of four references to Fan et al., Tsukamoto et al., Watanabe et al., and the Elliott excerpt did not establish a *prima facie* case of obviousness. Ueno was thus applied allegedly to make up for the deficiencies of the grounds of rejection based on the four references (Fan et al., Tsukamoto et al., Watanabe et al., and the Elliott excerpt):

> "The Examiner agrees that the previous combination of references did not render obvious the currently claimed invention...The previously applied references dry the coating prior to exposure The addition of Ueno...addresses that." (Final Rejection, page 6, first paragraph.)

Furthermore, the Examiner finds in a previous Office Action [page 4, Paper No. 17] that Fan et al. descriptions are deficient in at least three ways with respect to the rejected claimed subject matter:

> It would have been obvious to one skilled in the art *to* modify the process of example 1 of Fan et al. EP04446672 ***to*** use other epoxies...and *to* develop them

using solvents to remove uncured portions of the epoxy wave guiding layer.. and

to use cladding layer below and above the waveguiding core.

In fact, Fan et al., teaches **baking after applying** a photosensitive layer in order to drive off solvents and **before lithographic exposure** (see page 10, lines 40-53). Thus, in the method of Fan et al., Fan et al. recommend to the person of Section §103 that the coated photosensitive layer is in the solid state during the lithographic exposure step unlike the method of the present invention. Accordingly, in applicants view, modification of Fan et al. to correct the three deficiencies previously found by the PTO does not necessarily result in the claims under rejection.

Tsukamoto et al. teaches **removing solvents** after a coating step **and before irradiation** to ultraviolet rays (see col. 18, line 3 *et seq.*). Tsukamoto et al. additionally teaches that removal of solvents can be carried out by leaving the coated film as-is by heating or by decompression (see col. 18, lines 14 and 15). By removing solvents from the coated film in the method of Tsukamoto et al., the coated film is thus dried, *i.e.*, changed from the liquid state to the solid state, unlike the method of the present invention.

Moreover, when using the composition of Table 1 (see col. 30) of Tsukamoto et al., the content of EHPE-3150 in the coated film is calculated to be 59% after removing the dichloromethane and tetrahydrofuran. Taking into account Table 1, on page 11 of the present specification, Applicants estimate that the viscosity of Tsukamoto et al.'s coated film would be over 10,000 cps, which falls outside of the scope of Applicants' claims.

Watanabe et al. teaches spin-coating of a photoresist liquid having a viscosity of 3,800 cps (see col. 6, line 50, *et seq.*). The coated photoresist film is then **immediately cured** at a temperature of 100°C for 6 minutes **before exposure** to ultraviolet rays (see col. 6, lines 53 and 54). The preferred viscosity range in Watanabe et al. is given as 3,000 to 4,000 cps (see Col. 7,

lines 1 and 2). Thus, the photoresist film of Watanabe et al. is in the solid state during the exposure step as a result of the preceding curing step. Thus, clearly the viscosity of the photoresist film in the exposure step is not 3,800 cps.

The Elliott excerpt is relied upon by the Examiner as teaching spin coating techniques. Applicants submit, however, that the Elliott excerpt does not seem to supply the disclosure missing from the other references needed to construct a *prima facie* case of obviousness as it appears to be cumulative to the four other references.

The Examiner's combination of references does not teach or suggest a method in which a spin-coated photosensitive film of materials of specific viscosity parameters, remains in the liquid state during an irradiation (exposure) step. Moreover, Applicants submit that the Examiner's combination of references may not be fairly said to teach or suggest the advantage achieved by Applicants' method of providing a more uniformly cured product, *i.e.*, the core of the waveguide, so that this ground of rejection should be withdrawn.

Applicants respectfully request reconsideration. Applicants do not believe that **combined disclosures of Fan et al., Tsukamoto et al., Watanabe et al., Ueno and the Elliott excerpt establish a *prima facie* case of obviousness.** In summary, (a) there is no teaching and the Patent Office has presented no rationale to combine the references, (b) to arrive at the present invention, and (c) there is no teaching in the references that would lead one to expect the superior properties demonstrated by the invention.

In Applicants' view Ueno does not make up for the deficiencies of the previously applied four references. JP H09-243869 to Ueno teaches a method for connecting optical parts by dipping in a photosensitive solution and irradiating by laser beam. In Ueno, a liquid layer is formed by dipping a base substrate containing optical parts thereon in the photosensitive

solution, followed by irradiating laser beam to form **only a core** of a waveguide. The core so formed is surrounded by liquid material which acts as cladding.

In contrast to Ueno, the liquid photosensitive material of the present invention is spin-coated onto a substrate to form a film in liquid state. The film in liquid state is irradiated by actinic radiation with an appropriate mask to cure necessary portion(s) of the film. A core and both lower and upper cladding(s) can be formed sequentially with the method described above.

The liquid photosensitive material of the present invention has a viscosity of 500 to 10,000 cps. Illustrative liquids having a viscosity of 500 cps include olive oils or castor oils. Further, an illustrative liquid having a viscosity of 10,000 cps includes honey. Such a high viscous liquid used in the present invention will increase the difficulty to form a thin film with high uniformity in thickness. The dipping method employed by Ueno will not provide a film of highly uniform thickness with such a highly viscous liquid In the present invention, a film having high uniformity is provided by spin-coating method rather than dipping method; with the film is in the liquid state. Neither feature is described by Ueno. Moreover, Ueno provides no motivation to alter the conditions of the four previously applied references.

Reconsideration of the outstanding Office Action and an early allowance of the application are respectfully solicited.

Respectfully submitted,

Dated: March 24, 2004

Marina V. Schneller
Registration No. 26,032

VENABLE, LLP
Post Office Box 34385
Washington, D.C. 20043-9998
Telephone : (202) 344-4000
Direct Dial : (202) 344-4062